

Abstract of the Disclosure

The output voltage of an MRAM is increased by means of an Fe(001)/MgO(001)/Fe(001) MTJ device, which is formed by microfabrication of a sample prepared by the following steps. A single-crystalline MgO (001) substrate 11 is prepared. An epitaxial Fe(001) lower electrode (a first electrode) 17 with the thickness of 50 nm is grown on a MgO(001) seed layer 15 at room temperature, followed by annealing under ultrahigh vacuum (2×10^{-8} Pa) and at 350°C. A MgO(001) barrier layer 21 with the thickness of 2 nm is epitaxially formed on the Fe(001) lower electrode (the first electrode) at room temperature, using a MgO electron-beam evaporation. A Fe(001) upper electrode (a second electrode) with the thickness of 10 nm is then formed on the MgO(001) barrier layer 21 at room temperature. This is successively followed by the deposition of a Co layer 21 with the thickness of 10 nm on the Fe(001) upper electrode (the second electrode) 23. The Co layer 21 is provided so as to increase the coercive force of the upper electrode 23 in order to realize an antiparallel magnetization alignment.